

U.K. PET USERS CLUB

NEWSLETTER NO. 0

Welcome to the U.K. PET Users Club and in this issue, we have some hints on graphics animation, details of BASIC interpreter timings and memory usage, and of ASCII codes plus much more.

Printed in this and all subsequent issues, there will be a list of software available through the Users Club. The original list is small and Commodore Systems generated, but we hope to add many programmes in the near future. We intend to form a "Common Library" which will contain programmes submitted by PET users and we hope you will contribute. The contents of both Libraries will be printed in each issue.

For each of your programmes accepted, you will be given the choice of up to three from the Common Library, free of charge or you may purchase any programme from the Common Library for £1.00 per programme plus 30 pence for p+p. We also hope that you will write to us telling us of your applications for and your experiences with the PET. We will endeavour to publish as many of your letters and comments as we can and if anyone feels like submitting a small article, this will be most welcome. If you require a personal reply this will be guaranteed by enclosing a self addressed, stamped envelope.

The address to which you send your correspondence or orders is:-

The Software Manager,  
Commodore Systems Division,  
360, Euston Road,  
London, N.W.1.

N.B. Please note CHANGE OF OUR ADDRESS.



### A SHORT NOTE ON MOVING THINGS

Difficulty has been experienced by some of our users in moving the cursor under programme control and questions have been asked about how graphs and plots such as sine curves can be displayed.

As you probably already know, cursor control characters in quotes when printed will cause the cursor to move accordingly. If your experiments so far with this technique are giving slightly odd results, do make sure that you are terminating your print statement with a semi-colon. Failure to do this will cause the machine to output a carriage return/line feed at the end of the print statement, leaving the cursor just where you don't want it.

On the subject of plotting, the basic trick used with this type of graphic system is to first create strings full of cursor movement characters and then access parts of them using MID\$, etc. dynamically.

For a really good example of the use of this technique, I suggest you have a look at the technique used in our biorhythm programme.

## BITS AND PIECES

### ARE YOU READY?

There have been reported mysterious occurrences of the out of data error when editing and fiddling about in general.

This is not a bug, but is due to pressing RETURN whilst the cursor is over the READY prompt. The machine interprets this as READ Y and as there is usually no corresponding data statement around we get the error.

### REDO

It must be remembered that when RETURN is pressed, the machine consumes everything on the same line as the cursor, so even if you have correct information at the beginning of a given line, a single character of an incorrect type far over on the right hand side of the screen on the same line is likely to cause problems. A rather problematical example of this situation occurs if you try and put up a graphic form or set of boxes on the screen and then under programme control ask for data with an input statement, e.g.

### NUMBER ?

When the number is typed and RETURN is pressed, the graphics character making up the right-hand side of the box will be entered as part of the inputting data. In the case of input to a numeric variable, the graphics character is of course non-numeric and not allowed and will give the error ? Redo from start, so you must always leave such boxes open ended.

## INVERSE TRIGNOMETRIC FUNCTIONS

Here are a couple of handy methods of obtaining are sine and arc cosine (remember, the result will be in radians).

ASN<sub>X</sub> = ATN (X/SQR(1-X<sup>2</sup>))

ACS<sub>X</sub> = ATN (SQR(1-X<sup>2</sup>)/X)

For those of you who are used to working in degrees, here are some handy user defined functions:

DEFFNS(V) = SIN(V/(180/π))

DEFFNC(V) = COS(V/(180/π))

DEFFNT(V) = TAN(V/(180/π))

These are three user defined functions which when called with arguments and degrees will give the appropriate results. In these examples V can be any variable but if all three are defined in the same programme, you must use three different dummy variables.

EXAMPLE:           PRINT FNS(30)

Result of this will be .5. Notice that the argument for FNS, or FN anything for that matter, can be either a variable or numeric constant. Also, after a programme containing these definitions has been run, these functions may be called using FN in the direct mode, that is, from the keyboard directly without being in a programme.

## SECOND CASSETTE UNIT

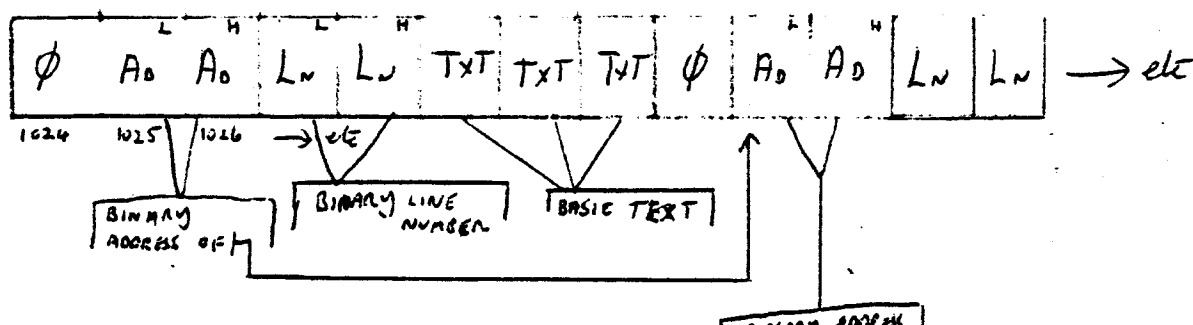
The second cassette unit with lead and plug ready to go straight onto the second cassette port on the rear of the PET, will be available from the beginning of May at a cost £55.00 plus V.A.T. Some of the early units shipped, may have a small section of the body cut away at the back. This is because, these particular cassettes were meant originally to fit inside the PET.

## 6502 PROGRAMMING MANUALS

This really excellent MOS technology generated 220 page manual will be available at a cost of £5.00 plus 30pence p+p from the beginning of May. This manual, if read carefully from the beginning, is an excellent guide to microprocessor programming in general, as well as being a first rate 6500 reference book. It is worth mentioning here, that for those of you who are interested in developing their knowledge and expertise in the field of microprocessing and cannot, at this point of time, afford a PET, then they might, perhaps, look at a KIM, a valuation board, which sells for £149 and contains a keyboard, display, 2K ROM plus 1K RAM, cassette interface, 2 timers and much more. This valuation board is available in London through A.E. Marshalls Ltd or in the West Country from G.R. Electronics of Newport, Gwent.

## BASIC PROGRAMME STORAGE

Below is a diagrammatic representation of the method used by the CBM basic interpreter for storing programmes in memory.



## EDITING

There is an interesting property of the screen edit routine which gives rise to the following effects:-

If you insert using the INS key, more spaces than you type in characters, the DEL key must be pressed twice the number of times there are spare spaces. E.g. If you insert six spaces in a middle of a line and only type in four new characters, the first two presses of the DEL key will produce inverse characters which will disappear on the next two presses. Remember, the INS key will move all characters including the one under the cursor to the right, whilst the DEL key will delete the character on its immediate left.

## INTERRUPT STRUCTURE

Interrupts (including Break or Software Interrupts) are handled by software polling.

When the processor recognizes an interrupt it vectors through FFFE, FFFF in ROM to a routine that first inspects the processor hardware (IRQ line low).

If it was caused by a Break instruction, a Jump Indirect is executed through locations 021B, C. If by a hardware interrupt then a Jump Indirect is taken through locations 0219, A.

These locations being in RAM may be user-modified to point to extra user code ahead of normal interrupt processing.

Note, however that the IRQ pointer is used by the cassette routines and should be restored to standard values before the cassette Save or Load functions are called.

Various sections of the I/O chips can be set up to cause interrupts through the IRQ line.

Example: POKE 59470,2 enables a negative edge on the user port CAL line to cause an interrupt.

However, have your code set up to handle it when it happens!

Also note that each pass through the regular interrupt code increments the time register.



# PET Matrix-Decoded Keyboard

See 515 & 516 in table below

	8	7	6	5	4	(3)	2	1			
64	I	"	#	\$	%	'	&	\	( )	+	
48	Q	W	E	R	T	Y	U	I	O	P	↑
32	A	S	D	F	G	H	J	K	L	:	
16	Z	X	C	V	B	N	M	,	:	?	re
0	sh	rv	@	[	]	sp	<	>	st	sh	
	16	15	14	13	12	11	10	9			

## Interesting Locations Accessible from BASIC

### Location (decimal)

### Contents

<sup>H</sup> <sup>L</sup> 225, 224 226	Byte address of screen line with Cursor Character position of Cursor (0 to 79)
515	Matrix-coordinate (row+column) of last key down 255 if no key down
516	1 if shift down, 0 if shift up
525 526-534	No. of characters in Keyboard Buffer Keyboard Buffer
578 to 587 588 to 597 598 to 607 610	Logical numbers of open files Device numbers of open files Read/write modes of open files How many open files
512, 513, 514 518, 517 59465, 59464	Clock that increments 60 times a second Clock that increments 30 times a second? Clock that decrements every microsecond
59456	WAIT 59456,32,32 waits for vertical retrace of display
64824	SYS(64824) simulates power-on reset
59469	Interrupt Flag Register; e.g., to input user port CA1: I=PEEK(59469) AND 2: POKE 59469,I: IF I=0 THEN CA1 low
59411	IEEE PIA B Control, e.g., to run cassette#1 motor N jiffies: 100 POKE 59411,53: T=TI 200 IF TI-T<N GOTO 200 300 POKE 59411,61 ADVICE: Run motor at least 3 jiffies per 191 output chars

# TIMING TABLES

## BASIC STATEMENTS AND I/O

CONSTRUCT	APPROX. TIME (MILLISEC)	STRING FUNCTIONS (Cont'd)	APPROX. TIME (MILLISEC)
FRE	1 to 10	VAL	1.3
PEEK, POKE	1	=, <, >, <=, >, >=	3 to 4
TI\$	3 to 4		
TI	1	ARITHMETIC FUNCTIONS	
GET	1 to infinity	FUNCTION ..	
POS	1	ABS	0.6
PRINT X or PRINT	15 to 19	ATN	42
PRINT X\$;	14 + LEN (X\$)/2	COS	27
READ X and DATA 3	9	EXP	27
REM	0.2 to 2	INT	1.2
RESTORE	0.3	LOG	23
TAB	2	RND RND (-1)	1.0
SPC(N)	1 + 0.6*N	RND (0)	0.9
FOR I = ... NEXT 1	4.0 + (1.6 each)	RND (1)	4.1
STEP	1.3	SGN	1.1
IF	0.4	SIN	25
GOTO or GOSUB	1.1	TAN	50
ON A GOTO or GOSUB		user FN	2.4
L <sub>1</sub> ..... L <sub>M</sub>	0.5 + (0.3*A) + (0.2*M)		
RETURN	0.9	ARITHMETIC OPERATORS	

Using colon,:, saves 0.6 over new line.

SAVE or LOAD

15 sec + (2 sec per 100 char)

i.e. 500 baud.

## STRING FUNCTIONS

FUNCTION	APPROX. TIME (MILLISEC)	SYMBOL	APPROX. TIME (MILLISEC)
+	0.5 + (0.2 per char)	OFB, 1fB	0.3
ASC	1	2fB	32
CHR\$	1.2	else	50 to 100
LEFT\$, RIGHT\$	3 + (0.025 per char)	/ O/B, A/1	0.5
LEN	0 to 8	else	2 to 5
MID\$	4 + (0.025 per char)	* O*B, A*O	0.4
STR\$	7 to 10	else	1.5 to 3
		+	0.3 to 1
		-	0.3 to 1
		=, <, >, <=, >, >=	0.7
		AND, OR	1.7
		NOT	1.4

# VARIABLES AND CONSTANTS

## ITEM

A, A\$, A =, A\$ =

AA, AA\$, AA =, AA\$ =

A%

A% =

999

.999

E16

E-16

"ABCDE"

M (I, J, ....)

## APPROX. TIME (MILLISEC)

0.7 to  $(0.7 + nv \cdot 0.1)$

nv = no. of variables

in program

0.2 more than above

0.3 more than A

0.6 more than A =

1 per digit

0.7 + (4.2 per digit)

0.2 + (0.4\* exponent)

0.2 + (3.0\* exponent)

$(0.6 \text{ to } 0.7) + (0.02$

per char)

$(1 \text{ to } 1.5) \cdot$

(no. of subscripts)

# TIMING PROGRAM

100 N = 300

200 T1 = T1

300 FOR I = 1 TO N

400 REM PUT TEST CONSTRUCT HERE

500 NEXT I

600 T2 = T1

700 FOR I = 1 TO N

800 NEXT I

900 T3 = T1

1000 PRINT 1000\*  $(2 \cdot T2 - T1 - T3) / (60 \cdot N)$

1100 END

## MEMORY USAGE (IN BYTES)

BASIC 1028 (I/O buffers, tables etc)

each statement

4 for line number and following space,

regardless for the line number

1 for each BASIC keyword

1 for each other character, including

RETURN

each variable with a value assigned, regard

less of spelling or value takes 7 bytes;

for string variables, add the length of

the string

each array (N.B., size includes 0th element)

take  $f \cdot (\text{size} + 1) + (2 \text{ per dimension})$  where

$f=5$  for floating point arrays,  $f=2$  for

integer arrays, and  $f=3$  for string arrays.

The system slows down noticeably when memory is  
nearly full.

Character ASC/CHR PEEK/POKE Character ASC/CHR PEEK/POKE Character ASC/CHR PEEK/POKE Character ASC/CHR PEEK/POKE

0		@	64	0	128		192	64
1		A	65	1	129	,a	193	65
2		B	66	2	130	,b	194	66
3		C	67	3	131	,c	195	67
4		D	68	4	132	,d	196	68
5		E	69	5	133	,e	197	69
6		F	70	6	134	,f	198	70
7		G	71	7	135	,g	199	71
8		H	72	8	136	,h	200	72
9		I	73	9	137	,i	201	73
10		J	74	10	138	,j	202	74
11		K	75	11	139	,k	203	75
12		L	76	12	140	,l	204	76
13	RETURN	M	77	13	141	,m	205	77
14		N	78	14	142	,n	206	78
15		O	79	15	143	,o	207	79
16		P	80	16	144	,p	208	80
17	↓	Q	81	17	145	,q	209	81
18	RVS	R	82	18	146	,r	210	82
19	HOME	S	83	19	147	,s	211	83
20	DEL	T	84	20	148	,t	212	84
21		U	85	21	149	,u	213	85
22		V	86	22	150	,v	214	86
23		W	87	23	151	,w	215	87
24		X	88	24	152	,x	216	88
25		Y	89	25	153	,y	217	89
26		Z	90	26	154	,z	218	90
27		[	91	27	155		219	91
28		\	92	28	156		220	92
29	⇒	]	93	29	157		221	93
30		↑	94	30	158		222	94
31		→	95	31	159		223	95
32	space	space	96	32	160		224	96
33	!	!	97	33	161	97	225	97
34	"	"	98	34	162	98	226	98
35	#	#	99	35	163	99	227	99
36	\$	\$	100	36	164	100	228	100
37	%	%	101	37	165	101	229	101
38	&	&	102	38	166	102	230	102
39	'	'	103	39	167	103	231	103
40	(	(	104	40	168	104	232	104
41	)	)	105	41	169	105	233	105
42	*	*	106	42	170	106	234	106
43	+	+	107	43	171	107	235	107
44	,	,	108	44	172	108	236	108
45	-	-	109	45	173	109	237	109
46	.	.	110	46	174	110	238	110
47	/	/	111	47	175	111	239	111
48	0	0	112	48	176	112	240	112
49	1	1	113	49	177	113	241	113
50	2	2	114	50	178	114	242	114
51	3	3	115	51	179	115	243	115
52	4	4	116	52	180	116	244	116
53	5	5	117	53	181	117	245	117
54	6	6	118	54	182	118	246	118
55	7	7	119	55	183	119	247	119
56	8	8	120	56	184	120	248	120
57	9	9	121	57	185	121	249	121
58	:	:	122	58	186	122	250	122
59	;	;	123	59	187	123	251	123
60	<	<	124	60	188	124	252	124
61	=	=	125	61	189	125	253	125
62	>	>	126	62	190	126	254	126

<u>Price</u>	<u>Name</u>	<u>Description</u>
£ 8.00	Othello	Cunning game of skill. Two levels of play, you against the computer.
£ 6.00	Pontoon	Board game. True 52 card pack plus amazing graphics.
£ 8.00	Wrap Trap	Dynamic graphics game in which the player has to trap the computer. Good arcade quality graphics.
£ 3.00	Noughts and Crosses	You against the computer.
£ 8.00	Lunar Lander	First class game of skill - in real time and with the odd surprise!
£ 5.00	Rotate	Difficult if you are not an expert! Similar to little plastic trays with moveable letters and letter missing.
£ 8.00	Biorhythms	Carefully written programme. Good graphics, with a real plot routine. Great fun for all the family.
£15.00	Disassembler	6500 series full disassembler asks for decimal starting location and lists from this point, gives full mnemonics and handles ASCII tables.
£ 3.00	Machine Code Handler	This programme allows you to type in a list of HEX codes from a given location. These routines can then be called using the SYS verb.

Please send 50p for p + p.

There are many more programmes in preparation including mathematics statistics and even a line re-numbering routine. These and many more will be announced in our next Newsletter. Many people have asked about a series of good quality short cassettes for the PET, so we have decided to make available C12 cassettes, with blank labels and in individual boxes at a cost of 50 pence each. There is a minimum quantity order of 10 cassettes, due to the small value of this item. Terms must be C.W.O.

It is also worth mentioning that Compendium Books of Camden Town have an excellent Home Computing section - carrying such things as Dr. Dobbs and Byte etc. Nearest tube is Camden Town also 74B and 31 busess.

#### STOP PRESS

R.Bailey Associates of 31 Bassett Road, London, W.10 are offering the following 2 items for sale from the beginning of May.

##### Item No. 1.

I EEE to R S 232 Slash Serial Interface for £79.50 + V.A.T.

##### Item No. 2.

Plug in Memory complete with Power Supply:

8K:- £225 + V.A.T.

16K:- £400 + V.A.T.